Foreword

1918 AND 2009: A TALE OF TWO PANDEMICS

Stephen C. Redd, MD
Thomas R. Frieden, MD, MPH
Anne Schuchat, MD
Peter A. Briss, MD, MPH

Learning lessons from previous pandemics is not merely an academic exercise. Our experiences from 1918 and other 20th-century pandemics helped us prepare for and respond to the 2009 H1N1 pandemic. In addition to better understanding these earlier pandemics, we must continue to learn and apply lessons from our experience with the current H1N1 pandemic to improve our ability to respond to future pandemics. Any reflection on the first pandemics of the 20th and 21st centuries must begin with gratitude for the fruits of science and technology, many of which were unimaginable in 1918. We can now detect, prevent, and treat disease; clarify the dynamic circumstances of pandemics; and save lives.

TODAY'S TOOLS

We have new tools to prevent, diagnose, and treat, including molecular assays and genetic characterization methods, which have continued to expand due to advances in molecular technology and a dedicated effort to improve disease detection generally. The diagnostic equipment that detected the first 2009 H1N1 case—occurring in a child in San Diego—was a prototype point-of-care device developed as part of the Centers for Disease Control and Prevention's (CDC's) recent pandemic preparedness efforts. Within weeks, CDC shipped diagnostic test reagents to laboratories throughout the U.S. and the world.

Development and licensing of polymerase chain reaction-based technology, which took place in the years before the 2009 pandemic, provided the foundation of efforts to determine the extent of H1N1 transmission during the pandemic. Development of these specific tools is part of a larger and unfinished effort to improve and disseminate laboratory methods to better detect influenza. Continuing needs include broader access to tests for antiviral resistance and simpler, more specific serologic tests to determine immunity.

The widespread availability of drugs to treat influenza during the 2009 H1N1 pandemic is a tribute both to modern science in developing these drugs and the foresight of pandemic planners in stockpiling them. However, current anti-influenza drugs have limitations: they are most effective when given early in the course of infection and drug resistance is an ever-present possibility. Developing new classes of drugs that have a larger window of effectiveness and are less prone to resistance is a high priority.

A vaccine that is effective against circulating influenza viruses is the best public health intervention to prevent influenza. During the 2009 H1N1 pandemic, we experienced both successes and failures with vaccine programs. Government and industry cooperation led to production of large quantities of a safe, well-matched vaccine that is likely to have been highly effective.

However, the current production method, based on growth of virus in eggs, is inconsistent and slow. Although vaccine was available within six months of the first detection of H1N1 virus, it did not become widely available until after most transmission had occurred in October and November 2009. Methods to produce influenza vaccine using cell-based or recombinant technology that would shorten the six-month timeline between virus identification and wide availability of vaccine are not yet available. We need new technologies that ensure rapid production of large amounts of influenza vaccine—and, ultimately, an influenza vaccine that is highly effective (particularly among the elderly), confers long-lasting protection, and protects against a wide range of influenza types.

TODAY'S SYSTEMS FOR DELIVERING INTERVENTIONS

Given the available tools, a critical challenge in the 2009 response was to use these tools as effectively, efficiently, and equitably as possible. The response required complex steps throughout society, including public recognition of risk, universal access to preventive and treatment services, and a well-equipped public health and medical workforce capable of applying these tools appropriately. As modern tragedies such as Hurricane Katrina and the 2010 Haitian earthquake illustrate, lifesaving tools can work only if they reach those who need them in time. In 1918, there were communities whose organized and confident response—despite the limited set of interventions available at the time—likely dampened the impact of the virus.[1]

Because the 2009 H1N1 pandemic involved a much less lethal virus than the 1918 pandemic, public health officials had to rethink plans that were based on previous assumptions and reassess whether community measures such as school closure were appropriate, who should receive treatment or prophylaxis with antiviral drugs, and which groups should be targeted for vaccination first. Available science, however incomplete, had to guide all decisions. In some cases, there was tension between the urgent need to collect and understand information and the need to take immediate action. And because implementation takes place at the local level, it had to be adapted to local capabilities and existing systems.

The process of developing and implementing the 2009 H1N1 vaccination program illustrates these tradeoffs. Public health officials designed an immunization strategy with built-in flexibility to accommodate local capacity and needs.[2] Some communities initially focused on school vaccination clinics, while others attempted to reach high-risk individuals through public clinics or by distributing vaccine to private providers. What worked best remains to be demonstrated, and will be the subject of ongoing evaluations essential to future planning. What is already clear, however, is that the effectiveness of the public health response depends upon the strength and capacity of the existing local public health infrastructure.

Intensive risk communication throughout the H1N1 pandemic helped people accept the uncertainties surrounding the evolving outbreak, and likely led to a lower level of public anxiety and disruption than would have otherwise occurred. The science of risk communication and transparent explanation of steps being taken to resolve uncertainty in public health emergencies derives distantly from the various experiences in 1918. In addition to communication with the public through the media, close working relationships and two-way communication between public health authorities and medical care providers assured that rapidly changing guidelines were adopted quickly.

Modern communication methods, including new media, can potentially overcome the politically driven, local obstruction to information sharing often seen in 1918, and effective use of these tools can counter rapid dissemination of misinformation and urban myths. However, provision of tangible interventions—such as immunizations, antiviral medicines, and intensive care ventilator support—requires local access that is highly dependent on local planning. And effective, credible communication depends on having accurate, up-to-date information.

THE INTERNATIONAL DIMENSION

The 1918 pandemic involved a substantial disease burden throughout the world, yet national awareness of circumstances in other countries was limited. Partly related to increased attention to emerging influenza strains such as the H5N1 influenza in Southeast Asia, and also attributable to the International Health Regulations (themselves a legacy of the 2003 severe acute respiratory syndrome epidemic), global cooperation was a prominent feature of the 2009 response. International influenza collaborations implemented prior to the start of the pandemic also provided unprecedented virologic data regarding the spread of 2009 H1N1 in resource-poor countries.

There were also obstacles to effective global response. Although efforts to strengthen prompt recognition of unusual influenza were well underway in parts of Asia, such efforts were not yet mature in Mexico where the first H1N1 cases likely circulated in February and March 2009. Detecting the virus just a few weeks earlier might have enabled availability of large amounts of vaccine before the surge in cases in October and November, even with current vaccine technology, thus demonstrating the need for additional enhancements in global influenza detection networks. Led by the World Health Organization, efforts to mobilize vaccines and treatment for resource-poor countries received substantial attention; however, despite good intentions, vaccine donations were slow to materialize and even slower to be implemented once received. Strengthening global cooperation and assistance in practice as well as in planning will be important for future progress.

HARVESTING LESSONS LEARNED

The 1918 and 2009 pandemics have implications for control of seasonal influenza as well as for response to other public health emergencies. Investments in improved technology for specific and speedy diagnosis, improved vaccines, and better treatment are obvious priorities. Much has been learned about vaccine delivery and school-based vaccination programs that can be applied to seasonal influenza immunization efforts and help us build on existing capabilities. Much has also been learned from local, state, federal, and international cooperation, which we must apply to both influenza and other preparedness and response issues. In the U.S., this response has highlighted the need to address the frayed state and local public health infrastructure. These lessons need to be learned and applied rapidly and effectively to improve public health capacity to prevent illness and death.

History continues to teach us about our country and ourselves. When the historians of the next century piece together the legacies of the 2009 H1N1 pandemic, perhaps they will look back with some pity at our dependence on egg-based vaccine technology that slowed production of vaccine. By then, high uptake of a universal and effective influenza vaccine may have relegated pandemics to the history books. An alternative and perhaps cautionary future scenario is that insufficient sustained commitment to the ongoing risk of pandemics, the high toll of illness and death associated with seasonal influenza, and limited investments in better vaccines and delivery systems in the years after the 2009 pandemic will leave the 22nd century facing its pandemics with little more speed or effectiveness than we have managed.

Stephen C. Redd, MD, is Assistant Surgeon General and Director of the Centers for Disease Control and Prevention's (CDC's) Influenza Coordination Unit. Thomas R. Frieden, MD, MPH, is Director of CDC. Anne Schuchat, MD, is Assistant Surgeon General and Director of CDC's National Center for Immunization and Respiratory Diseases. Peter A. Briss, MD, MPH, is CDC's Acting Associate Director for Science.

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Address correspondence to: Stephen C. Redd, MD, Influenza Coordination Unit, Centers for Disease Control and Prevention, 1600 Clifton Rd., NE, MS A-20, Atlanta, GA 30333; tel. 404-639-2293; fax 404-498-1088; e-mail <scr1@cdc.gov>.

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